

35A / 1173 Nightmute Bulk Fuel Upgrade (BFU) Project – Community Tank Farm  
Final Closeout Summary Report  
June 21, 2011

This Final Closeout Summary Report is filed with the federal grantor agency the Denali Commission (“Denali” or “DC”) by the grantee partner Alaska Village Electric Cooperative, Inc. (“AVEC”). The federal grant awards affected by this report and by this project are: 0049-DC-2002-I2, 170-05, 349-07, and 1173.

An initial project closeout report entitled “Award Transition and Closeout Summary” was submitted for this project on June 9, 2009. At the time, the project was still in construction under an active Denali award, 349-07. That initial, transitional closeout report was necessary because funds allocated to this project from the earlier Denali awards 0049-DC-2002-I2 and 170-05 had been fully expended, and the awards had expired and were being closed. This final closeout summary report is being filed because the project is now complete, all funding has been expended, and awards 349-07 and 1173 have also expired and being closed. No federal funds are available for de-obligation from any award on this project. Total project costs exceed total project funding by \$373,520.

The following report represents the project status as of September 30, 2010. All storage capacities are stated in terms of gross capacity.

**Background** - Nightmute (population 250) is located on Nelson Island in remote western Alaska. It is 18 miles upriver from Toksook Bay and 100 miles west of Bethel. It lies at approximately 60° 28' N Latitude, 164° 44' W Longitude (Sec. 33, T005N, R088W, Seward Meridian). Nightmute is organized as a second class city and is located in the Bethel Recording District. Nelson Island has been inhabited by the Qaluyaarmiut, or "dip net people," for 2,000 years. The area has been relatively isolated from outside contact, and has kept its Yup'ik Eskimo traditions and culture. The Nightmute economy is a mixture of subsistence and cash-generating activities; employment is primarily with the city government, school, services, commercial fishing and construction. Trapping and crafts also provide cash income. Almost all families engage in either commercial or subsistence fishing, and most have seasonal summer fishing camps; 31 residents hold commercial fishing permits in the herring roe and salmon fisheries. Nightmute is influenced by a marine climate; precipitation averages 22 inches, with 43 inches of snowfall annually. Summer temperatures range from 41 to 57; winter temperatures are 6 to 24.

**Activities** - Project participants were as follows: AVEC, which acted as project manager; the Lower Kuskokwim School District (LKSD), which owns and operates a dedicated portion of the tank farm to serve its school facilities; the City of Nightmute (City), which owns the remainder of the tank farm; Nightmute Tribal Council (NTC), which operates the City portion of the tank farm and uses it to supply/sell fuel to the community; and Chinuruk, Inc. (the state-chartered ANCSA village corporation for the village of Nightmute), which provided the site for the tank farm under a long term lease.

The project included no fuel storage capacity for AVEC. Under a separate, related project (Denali project 35B) AVEC installed a standby backup power plant concurrently with and adjacent to this tank farm project. On those occasions when this standby generator is required to run, AVEC obtains the fuel for it from LKSD under an ongoing supply agreement. The primary power plant is located in nearby Toksook Bay; it has the capacity (including additional fuel storage capacity) to also provide Nightmute's power demand, and does so by means of a transmission intertie between the two villages (Denali project 27I). This intertie was under construction at the time that design was completed and construction began on the Nightmute BFU and standby power plant projects (Denali projects 35A/1173 and 35B, respectively).

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Two Conceptual Design Reports (CDR's) were prepared for this project. The first CDR was completed by NANA Pacific in March, 2005; it included storage capacity for AVEC, LKSD and Chinuruk, all in a single new tank farm. The preferred site identified was just south of the new school at the south end of the village; community members unanimously supported this site at a community meeting on July 28, 2003. The CDR also planned for a new modular power plant with a recovered heat system linked to the nearby school, and provided room for a utility-scale wind turbine that could be considered in the future. As this first CDR was being released, AVEC was installing a new modular power plant in nearby Toksook Bay (pop. 600); and was building an intertie from Toksook Bay to nearby Tununak; and was designing (conceptually) a second intertie to connect Toksook Bay to Nightmute; and was envisioning a utility-scale wind farm at Toksook Bay.

It was determined that the new power plant in Toksook Bay could easily be built large enough to power all three villages (Toksook Bay, Tununak and Nightmute). Concurrently it was also determined that substantial life-cycle cost savings were achievable from having one less modular power plant (the one initially planned for Nightmute), and from sharing the benefits of the Toksook Bay wind farm with another (third) village. Consequently, funding was concentrated on the Toksook Bay – Nightmute intertie and Toksook Bay wind farm; planning ceased for a Nightmute modular power plant, in favor of a much smaller, less costly standby backup generator, to provide electric power to Nightmute only during times when power from the intertie is not available.

With these events, the originally-chosen site lost two major advantages. First, since no full-size power plant was planned for Nightmute, a recovered heat system was also no longer viable, and therefore it was no longer particularly advantageous to place the entire complex of facilities adjacent to the school (the intended recipient of the recovered heat). Second, with wind generation being concentrated in Toksook Bay, the eventual tank farm location no longer needed the ample future expansion space that a wind turbine would require. With these advantages removed, the disadvantages of the originally-chosen site, mainly that it was in an area prone to flooding and that it would have required an expensive driven-steel-pile foundation, now outweighed its advantages.

The second CDR, considered an update of the first CDR, was completed by Coffman Engineers in February, 2007. It identified as the new preferred site, an abandoned gravel pit (borrow site) on the northeast edge of the village that is well outside of the floodplain of the Toksook River. This CDR included site plans for the new preferred site, reduced the scope of the project in view of the contraction of the facilities planned for AVEC, and updated the cost estimates accordingly. During a site visit and community meeting in Nightmute on May 11, 2005, the community concurred with the selection of this option and voted in support of a land lease to facilitate constructing the bulk fuel and standby backup generator projects. The Business Operating Plan was approved by the community stakeholders in March 2007 and approved by the Denali Commission on May 15, 2007.

Construction began in May of 2007. The design engineer was Coffman Engineers; construction was managed by STG, Inc., using a managed construction approach. The new fuel storage tanks, fuel distribution equipment, and materials for the fill pipelines, foundations, secondary containment and other components,

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were transported to and staged in Nightmute. The abandoned borrow site was leveled to provide a working surface to build the new community bulk fuel storage facility; during this civil phase of the project, it became clear that the site needed to be enlarged onto the adjacent Native allotment in order to accommodate the project. The allottee/owner agreed to subdivide her parcel and sell the required expansion portion to the bulk fuel project. This land transfer required the approval and participation of the Bureau of Indian Affairs (BIA) and its local agent, the Bethel-based Association of Village Council Presidents (AVCP). Because further construction at the site depended upon control over the allotment parcel, and because this was delayed until all documentation had been presented, reviewed, and approved by BIA/AVCP, construction at the site was halted. The subdivision, purchase, and BIA/AVCP approval processes took approximately a year and a half to complete. Final, formal notice arrived late in the season of 2008, and a limited scope of work was completed before winter arrived, but work did not fully recommence until the spring season of 2009.

The marine header and sections of the fill pipeline were fabricated in Nightmute and staged in summer and fall 2008. The construction manager took advantage of the late season, frozen-ground conditions and installed the above-ground pipelines from the airport road to the tank farm site, over tundra that would be difficult to traverse during warmer conditions.

During construction in 2008, it was determined that without substantial additional processing, most of the locally-available gravel would not meet the standards specified in the project's engineering design. Separately, a major airport expansion project was also being constructed in Nightmute during 2008-2009 by a different construction team; while the bulk fuel project was delayed, the airport project consumed the small amount of readily-available high quality ("to-spec") gravel. Construction managers on the airport project decided to bring in specialized processing equipment in 2009 to produce the large amount of gravel required for that project. To continue progress on the bulk fuel project, an initial quantity of to-spec gravel was imported by barge late in 2008, at a relatively very high cost per ton, and stockpiled it so as to have it available early in the 2009 construction season. Once airport construction (including gravel processing) was well underway later in the 2009 construction season, the balance of the material required for the bulk fuel project was purchased from the airport project.

Construction continued through 2009, when all major components were completed; a substantial completion project inspection was conducted on Oct. 13, 2009, resulting in the participants' acceptance of the facilities. LKSD and the City both received inaugural shipments of fuel into their respective facilities in July 2010, at which the operators were trained on all operations, maintenance and spill procedures.

The new City facilities include one dual-product dispenser for retail sales adjacent to the tank farm. Two fill pipelines were laid side-by-side from the marine header at the barge landing to the tank farm, one for gasoline and one for diesel fuel; each pipeline is approximately 1200 feet long, for a total fill pipeline length of approximately 2400 feet. The fill pipelines supply both the LKSD and City tanks. The City tanks are situated in a secondary containment cell; the LKSD tanks are self-diked and do not require additional secondary containment. Storage capacities by participant and type are presented in the following table:

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Participant	Type	Use	Number of Tanks	Gross Capacity Per Tank, gallons	Total Capacity, gallons
Lower Kuskokwim School District	Bulk	Diesel	1	27,000	27,000
	Intermediate	Diesel	1	4,000	4,000
	<b>LKSD Total</b>		<b>2</b>		<b>31,000</b>
City of Nightmute (owner); Nightmute Tribal Council (operator)	Bulk	Diesel	2	27,000	54,000
	Bulk	Gasoline	1	27,000	27,000
	Bulk	Gasoline	1	10,000	10,000
	Dispensing	Diesel	1	5,000	5,000
		Gasoline		5,000	5,000
	<b>City Total</b>		<b>5</b>		<b>101,000</b>
<b>Grand Totals</b>			<b>7 tanks</b>		<b>132,000 gallons</b>

**Funding, Costs and Cost Containment** - All official funding to date has been provided by Denali Commission grants to/through AVEC, shown as follows:

Funding and Costs: Project 35A Nightmute Bulk Fuel Upgrade	Federal Funding (DC)	Expenditures (Costs)
DC award 0023-DC-2001-I5	\$ 25,000	
DC award 0049-DC-2002-I2	\$ 260,000	
DC award 170-05	\$ 2,434,386	
DC award 349-07	\$ 209,614	
DC award 1173	\$ 702,305	
<b>Total Funding (Budget)</b>	<b>\$ 3,631,305</b>	
DC award 0023-DC-2001-I5		\$ 25,000
DC award 0049-DC-2002-I2		\$ 260,000
DC award 170-05		\$ 2,434,386
DC award 349-07		\$ 209,614
DC award 1173		\$ 702,305
Costs not funded (overrun)		\$ 373,520
<b>Total Actual Costs</b>		<b>\$ 4,004,825</b>
Costs in excess of funding		\$ 373,520

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Total costs (\$4,004,825) exceed total funding (\$3,631,305) by \$373,250. Since no part of the project is owned by AVEC and there is no dedicated storage capacity for AVEC, no AVEC match is required. However, until additional DC or other non-AVEC funding is allocated to this project, AVEC has in the interim incurred the additional costs not covered by the funding outlined above. Funding for this shortfall (\$372,520) has been requested from the Denali Commission.

Design Shell Capacity:	132,000 gallons
Constructed Shell Capacity:	132,000 gallons

Constructed cost per gallon	\$ 30.34 per gallon
Denali Commission benchmark cost	\$ 9.50 to \$12.00 per gallon

The constructed cost per gallon of storage capacity is \$18.34 (about 153%) greater than the Denali Commission cost containment benchmark for a tank farm of this size in this location.

**Problems Encountered/Lessons Learned** - The process required to obtain site control to a portion of a Native allotment delayed the project for more than a full construction season. The need for the additional property was not identified in or addressed by the second CDR, however it may not have significantly improved the planning had it been included, since procurement and construction began very soon after the second CDR was completed. Once the need for the additional property was identified, a real estate sales agreement was signed by all parties and funds to pay the purchase price were set aside in escrow within a very short time thereafter. While awaiting BIA's approval, construction came to a halt but many costs continued to be incurred; for instance, construction equipment could not be easily shifted to projects in other villages without costly demobilization and remobilization, and maintenance of the field camp had to continue. The BIA approval process was delayed by illness of key agency personnel and the very lengthy process that ensued was not anticipated. Future projects that might require BIA approval should plan for longer time spans for concluding such transactions.

During the lengthy construction delay, two key project management positions turned over; the learning curve required at these positions at this critical juncture led to a significant underestimate of the cost to complete, as well as inefficiencies in day-to-day planning and execution of the remainder of the project than might otherwise have occurred. The turnover itself could neither have been predicted nor controlled, but its negative consequences were exacerbated by the lengthy construction delay.

This project had achieved a 65% design at the originally-chosen site by the time the final site was selected, resulting in a substantial redesign appropriate to the new site. Despite the additional time and costs this redesign required, these efforts ultimately resulted in a better project at a site not prone to periodic flooding, with an anticipated lower life-cycle cost and increased service life expectancy.

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Procurement of enough gravel that would meet the specification laid out in the engineering design took a great amount of time and effort. Eventually, delays in the bulk fuel project caused its actual construction schedule to coincide with the airport project that was handling large volumes of gravel, which created a solution to the material problem. The airport project consumed the small available amount of high quality, ready-to-use gravel; after that was depleted, nearly all of the gravel for both projects either had to be dug from the local borrow source and subjected to further processing, or imported by barge. The airport project construction team recognized that it would be cost-effective for them to mobilize additional equipment into Nightmute to screen sufficient local material to complete their relatively gravel-intensive project. Their decision ultimately benefited the community bulk fuel project by providing a high quality source of gravel available for purchase by the bulk fuel project. While this avoided the very high cost and additional risk (resulting from unpredictable, uncontrollable river levels) of importing gravel by barge, ultimately all of the gravel used on the bulk fuel project was purchased at a higher cost than the original cost estimates had anticipated. The schedule and cost impacts of concurrent projects sharing the same borrow source had unforeseen impacts on the bulk fuel project, however eventually these problems were solved to the benefit of both projects.

**Outcomes and Conclusions** - The Nightmute Community Bulk Fuel Tank Farm is complete and provides code-compliant bulk fuel storage for most or all of the fuel used by the community. The new facilities replace 153,602 gallons of substandard fuel storage.

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